

Engineering Tripos Part IIA Project, GC4: Vibration Isolation for a Rocket Payload, 2022-23

Leader

[Dr J P Talbot](#) [1]

Timing and Structure

Thursdays 11-1pm and Mondays 9-11am plus afternoons

Prerequisites

3C6 useful

Aims

The aims of the course are to:

- investigate a range of methods for modelling vibration response, suitable for guiding the design of a mechanical system;
- learn about the principles of vibration isolation;
- design a vibration isolation system to meet a given specification, using a combination of theoretical modelling and experimental testing.

Content

The intense vibration of a rocket launch poses significant challenges for the designers of any launch vehicle or its payload. This project considers the design of a vibration isolation system for a sensitive payload – a satellite containing a sensitive instrument. It involves modelling the vibration behaviour of a prototype satellite structure, the design and assembly of the isolation system, and some shaker testing to verify the final design. The work is based on theory and techniques introduced in Part IA Mechanical Vibrations and the Part IIA Module, 3C6.

FORMAT

Students work individually in Weeks 1 and 2, for which individual interim reports are submitted. The design exercise in Weeks 3 and 4 is undertaken in groups of three, in which each student is responsible for a specific design concept and the corresponding section of the final report.

Week 1

Familiarisation with the prototype structure and test rig. Conduct initial vibration tests. Manual calculation of natural frequencies. First interim report.

Week 2

Develop theoretical model. Predict vibration response and compare with initial test data. Update model. Second interim report.

Weeks 3 & 4

Develop model to select and refine isolation design. Assemble prototype. Conduct shaker test to verify design. Final report and group presentation.

Coursework

Interim Report 1 (individual)	4pm Friday 19 May 2023	
Interim Report 2 (individual)	4pm Friday 26 May 2023	
Final Report (group)	4pm Friday 9 June 2023	

Booklists

D.E. Newland, *Mechanical Vibration Analysis and Computation*. Longman, 1989

D.E. Newland, *An Introduction to Random Vibrations, Spectral & Wavelet Analysis*, 3rd Ed. Longman, 1993.

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [2].

Last modified: 09/05/2023 17:06

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Links

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